

# **Bifurcation Stent Strategy Insights from 3D Bench Imaging**

**John Ormiston, Mark Webster, Kenneth Wu, Bruce  
Webber, Peter Ruygrok, Jim Stewart, Patrick Kay  
Auckland, New Zealand**

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Trust**



- Bifurcations remain a problem for PCI**
- Immediate and long-term outcomes are not as good as non-bifurcated lesions**
- Early and late stent thrombosis more common**
- Restenosis most commonly occurs at the SB ostium**

- It is generally agreed that 1 stent is better than 2
- No agreement on technique if the side-branch needs stenting

If DES are used, the procedure should be

- Safe- SB protected
- Full scaffolding of SB ostium to support and apply drug
- Stent(s) should be fully expanded at SB ostium
- No gaps
- No metallic obstruction of SB or MB
- Ideally no multiple layers of stent
- Technically easy

# Aim

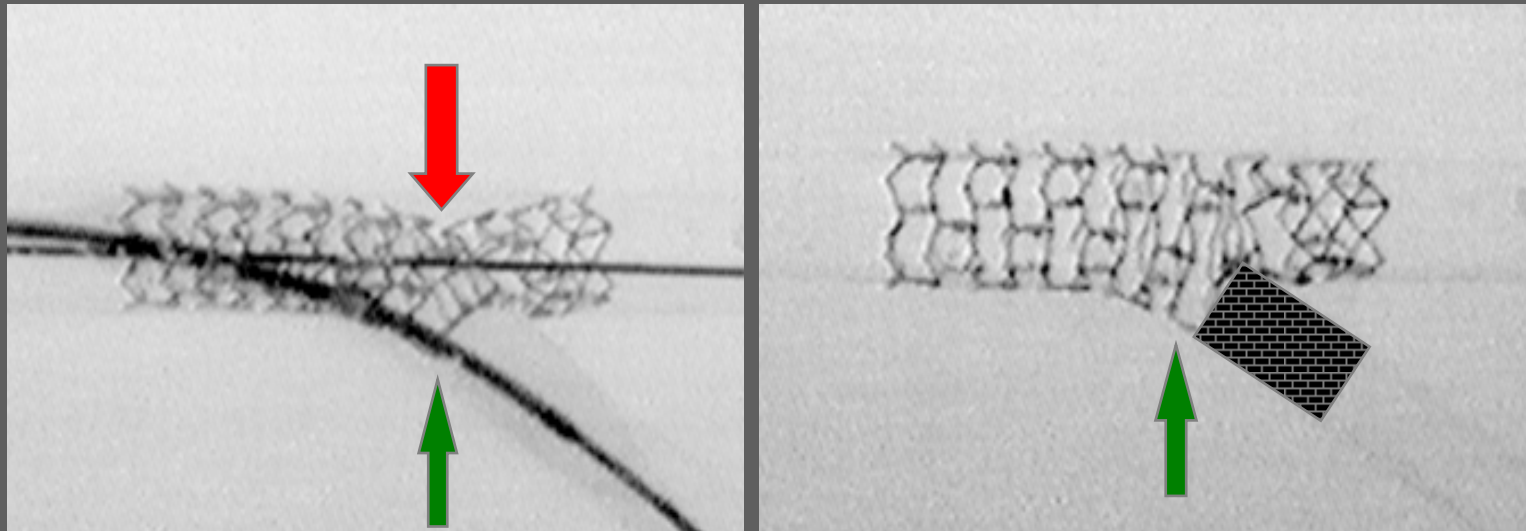
- ❑ To provide insights into a range of stenting strategies that use conventional (non-dedicated) drug-eluting stents

# Methods

- Stents were deployed in silicone block phantoms under fluoroscopic control
- Imaged by Computed Tomography
- 3D reconstruction
- Dedicated bifurcation stents are the subject of a different presentation

# “T” stenting

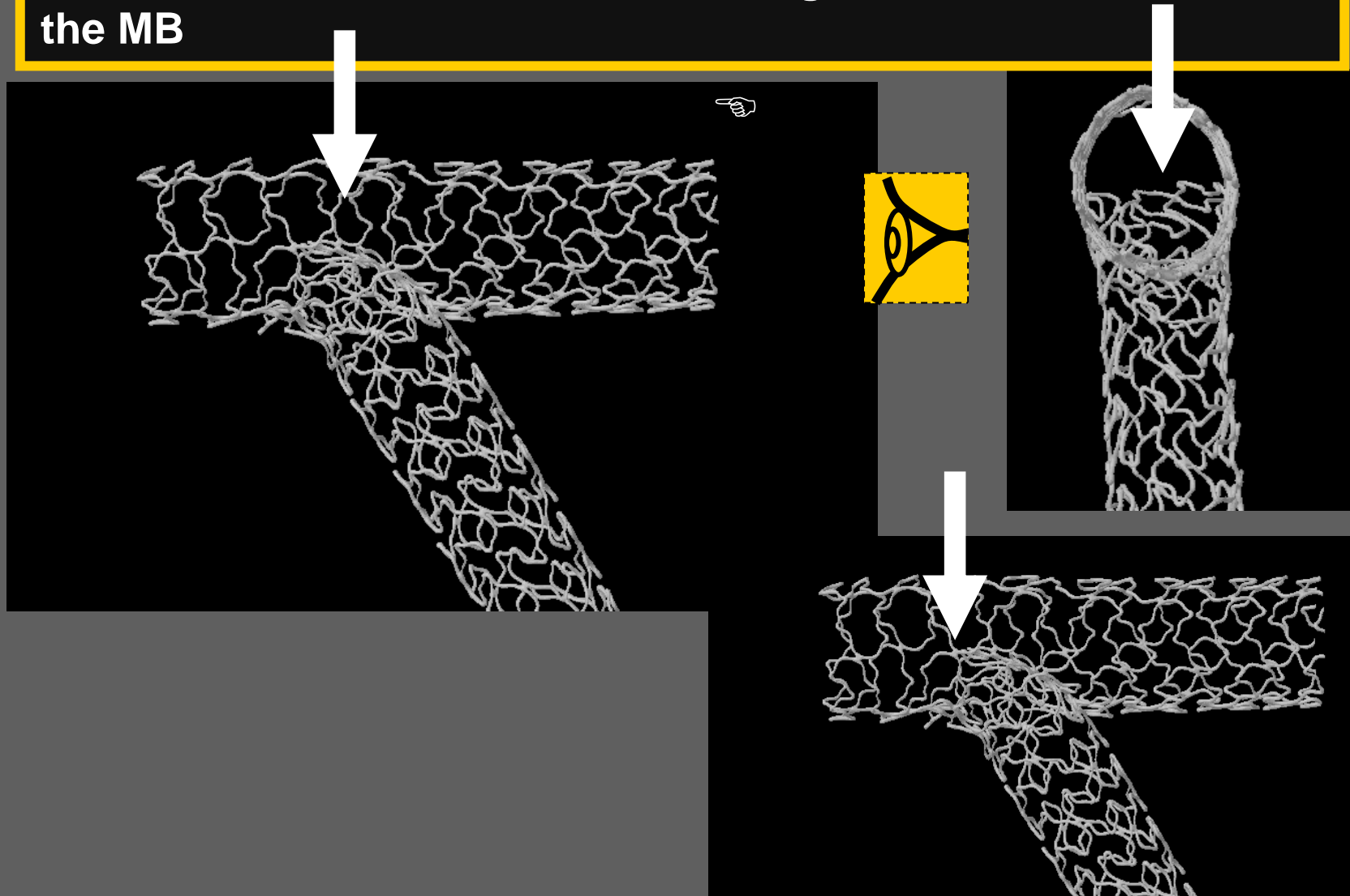
With kissing balloon post-dilatation esp through a distal cell, there is the potential for full coverage at the SB ostium



*Lefevre et al*

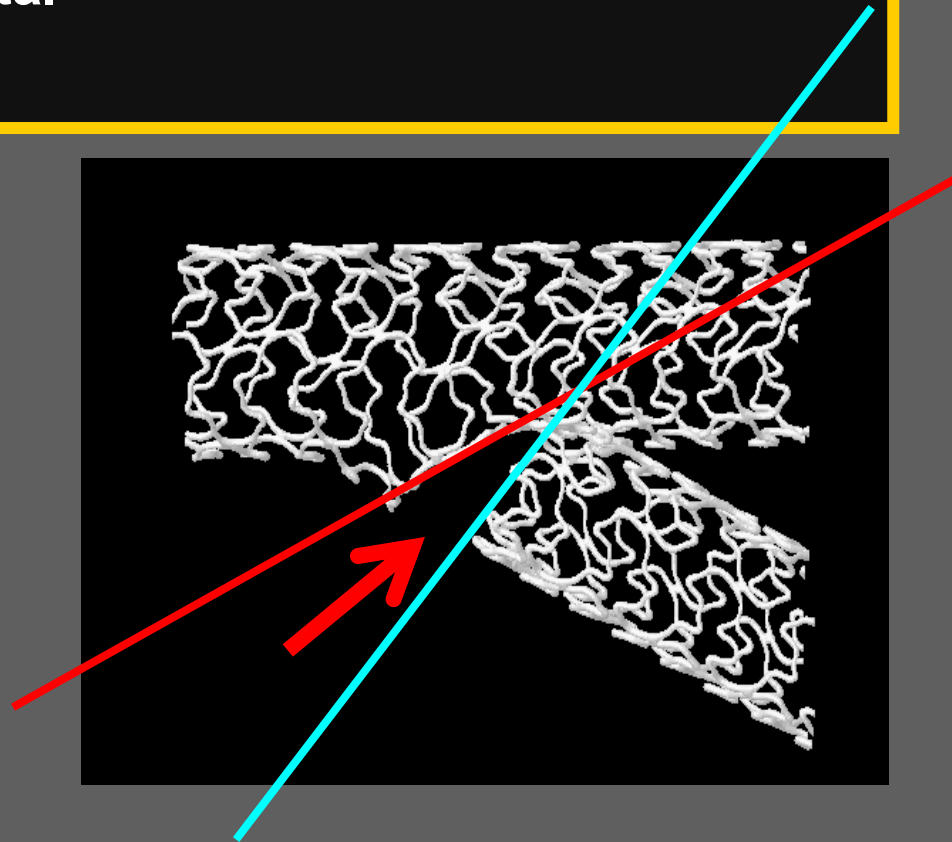
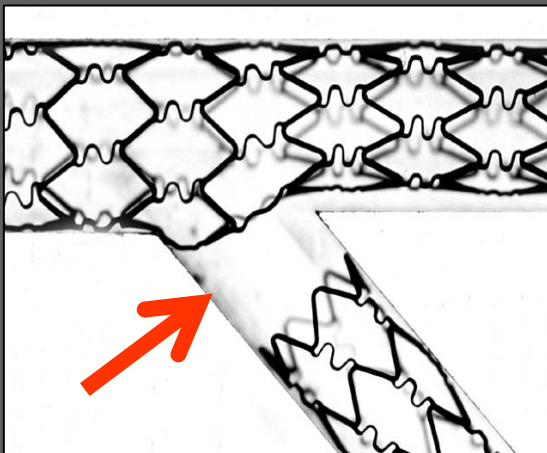
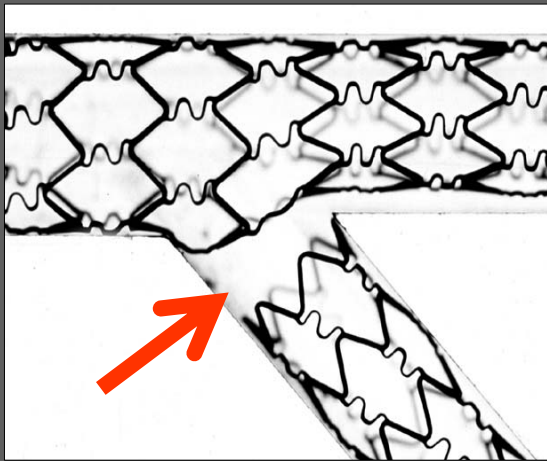
## However, with “T” Stenting

The SB stent may be too proximal and Kissing Post-Dilatation does not correct this nor does kissing crush the SB stent in the MB



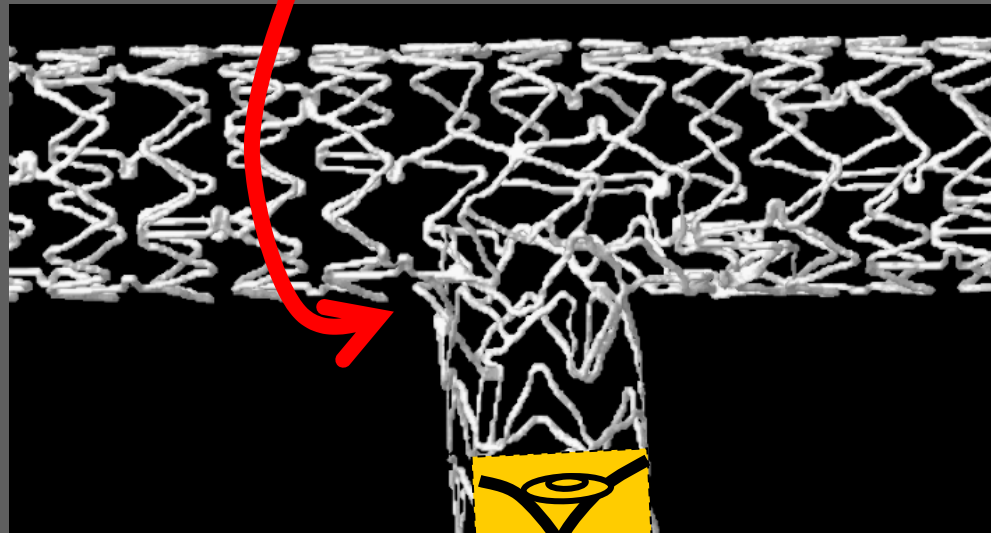
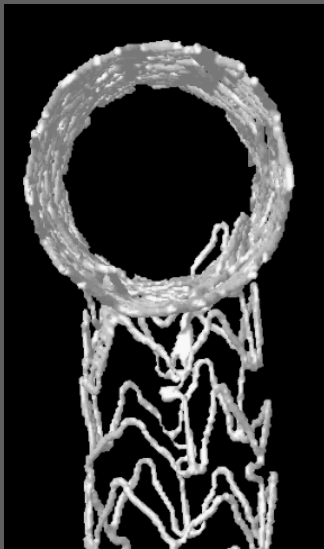
With “T” stenting there may be a gap in scaffolding and drug application due to--

- ❑ The stent being too distal
- ❑ Shallow angle





With “T” stenting in steep bifurcation angles (eg L main), it is easier to deploy SB stent without a gap

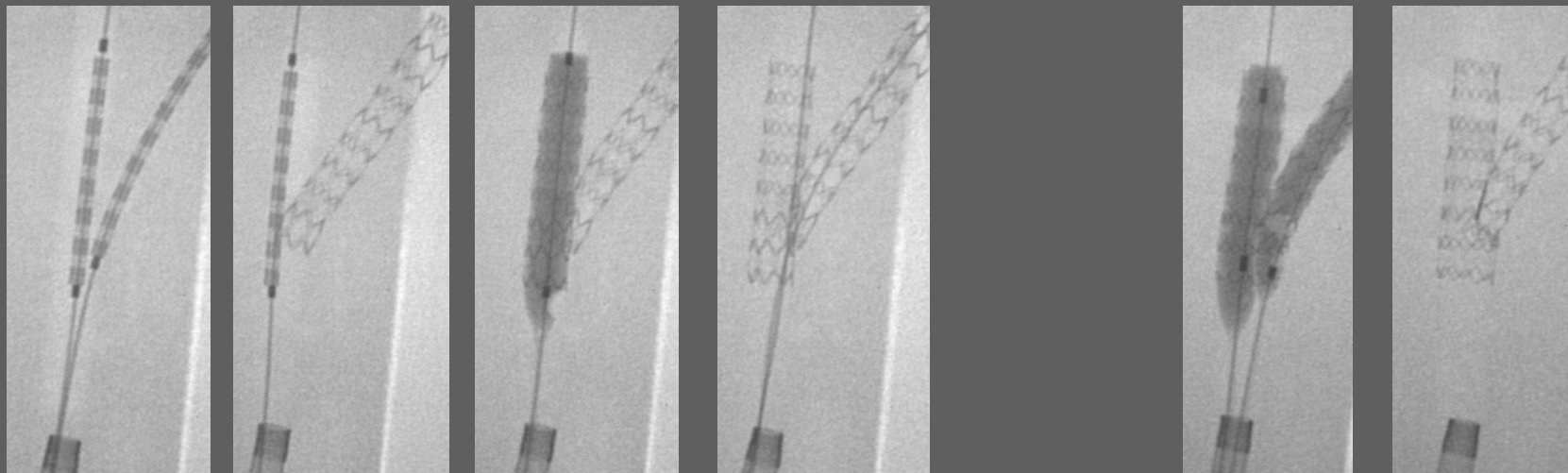


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## **Crush Technique**

- Aim is to scaffold SB ostium fully without gaps so that ostium is supported and drug applied**
- Sometimes difficult to cross to SB for kissing**
- Multiple layers of stent**

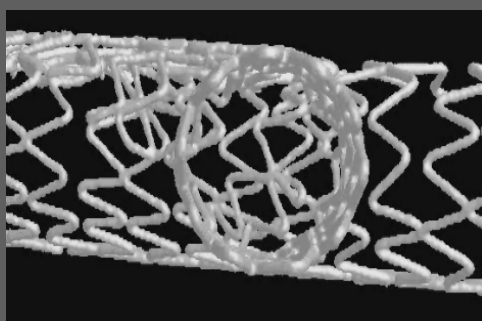
# Crush Technique with “one step” kissing post-dilatation



**It is clearly established that Kissing Balloon Post-dilatation after Crush improves outcomes as predicted by bench testing**

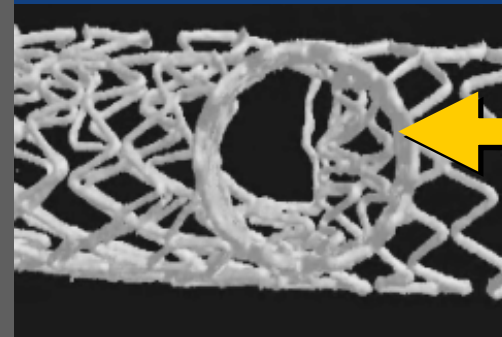
Ormiston et al CCVI 2004;63:332  
Ge et al JACC:46:613  
Hoye et al JACC;47:1949

Before Kissing



**2 layers of struts separating MB from SB with Crush and no kiss**

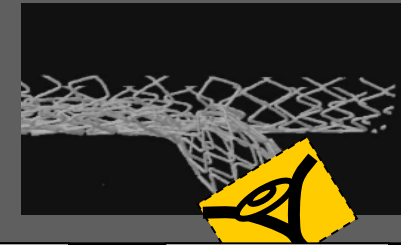
After "one step" Kissing



However struts remain after one step crush

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**“One Step” Kissing Post-Dilatation**  
There is metallic narrowing of the SB ostium with all stent designs and all angles.



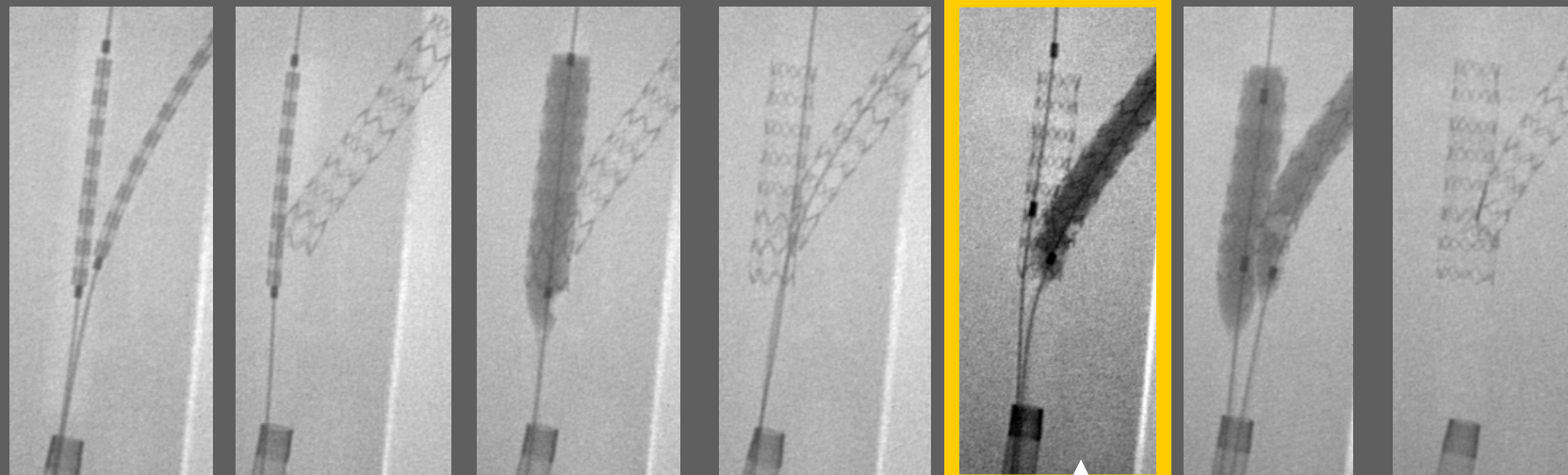
	CoStar	Select	Liberte	Driver	Vision
SB angle 30degrees					
SB angle 60degrees					
SB angle 90 degrees					

Stent underexpansion at the SB ostium  
may be the major cause of restenosis

*Costa RA et al JACC 2005;46:599*

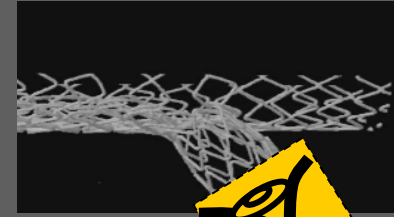
Underexpansion may predispose to stent  
thrombosis

# Crush Technique with “two step” kissing post-dilatation (Colombo)



SB dilatation with a non-compliant balloon to high pressure (>20 atmos)

# 2 Step Kissing Post-Dilatation fully expands SB stent with improved scaffolding and no obstruction



Express

Velocity

Select

Liberte

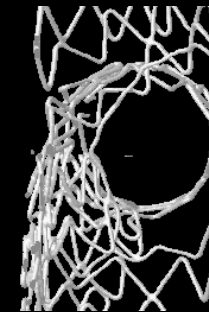
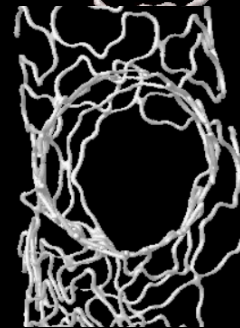
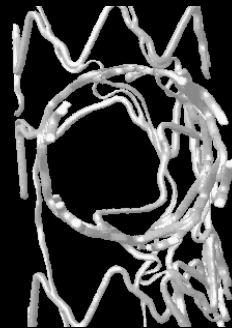
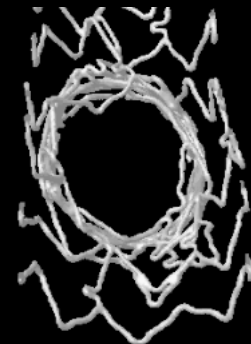
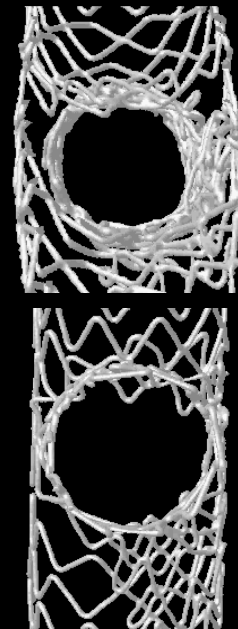
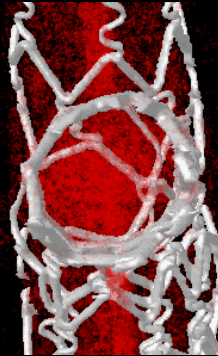
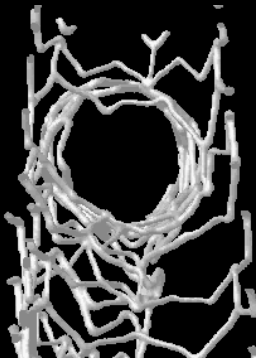
Driver

Vision

SB angle  
30degrees

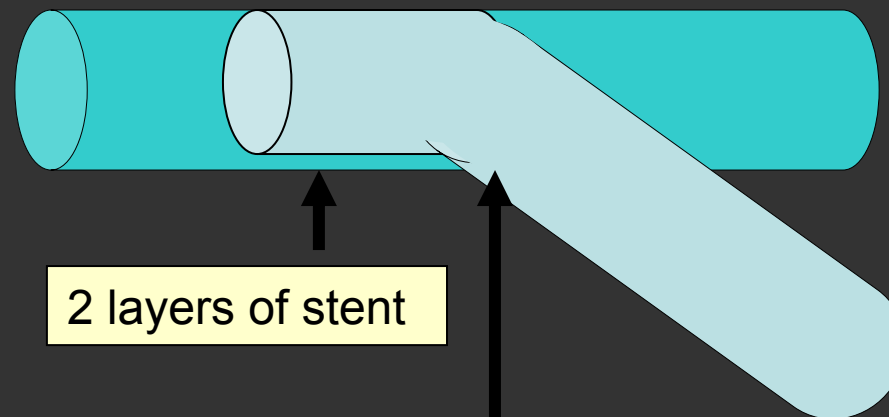
SB angle  
60degrees

SB angle  
90  
degrees





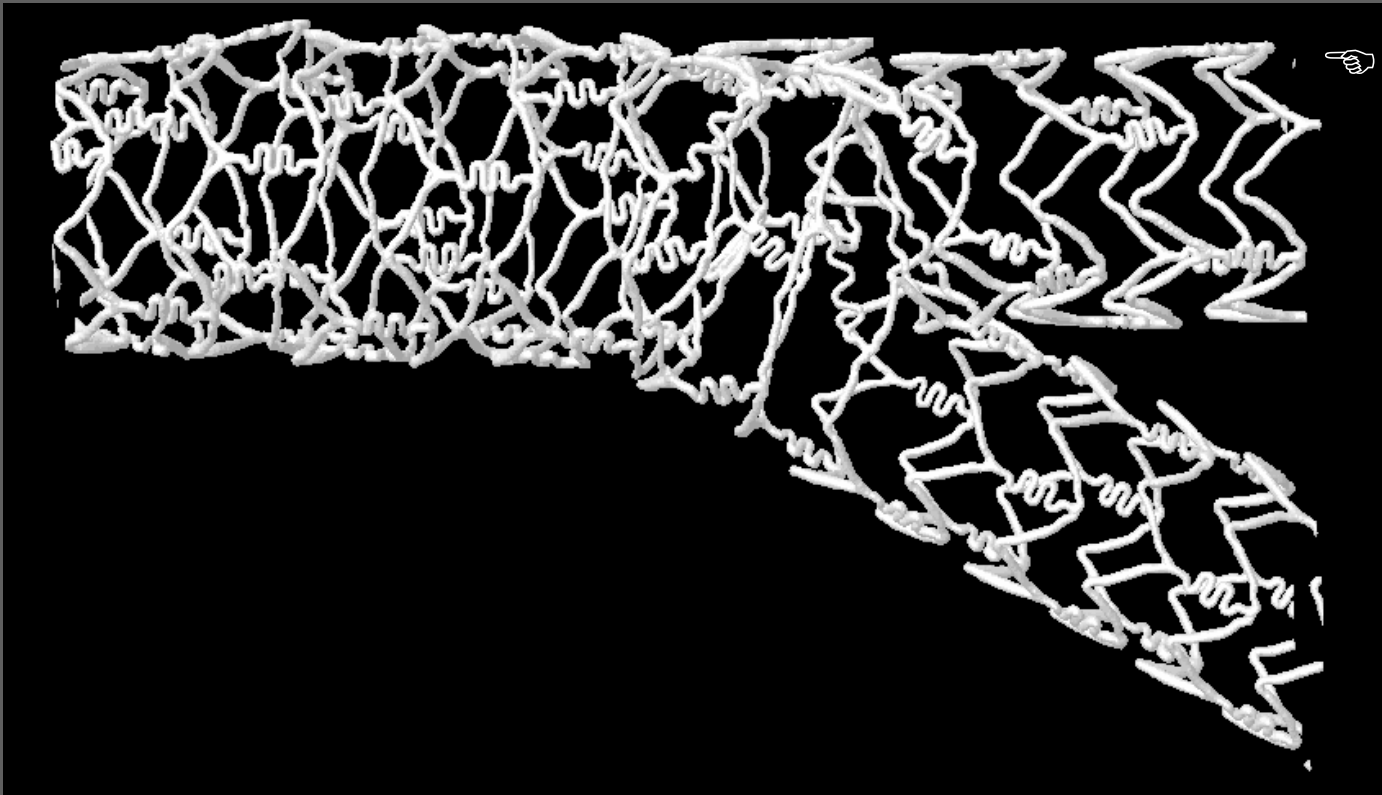
# Provisional SB stenting with the “Culotte” Technique



2 layers of stent

Potential for good ostial scaffolding and drug application

## Culotte Technique for Provisional or Elective SB Stenting



**Good ostial expansion and coverage.  
Technically more difficult**

# Provisional SB stenting with culotte technique



CoStar

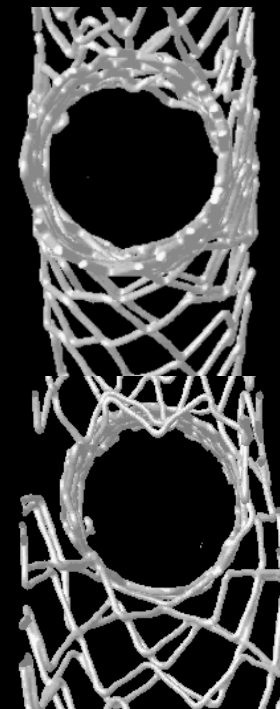
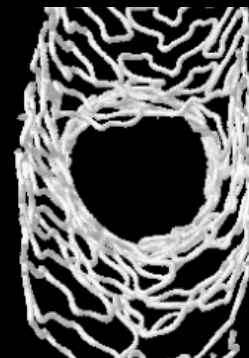
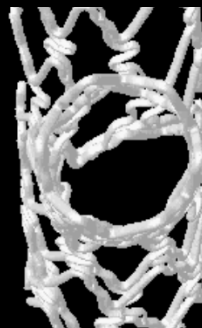
Select

Liberte

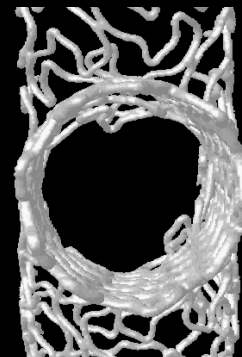
Driver

Vision

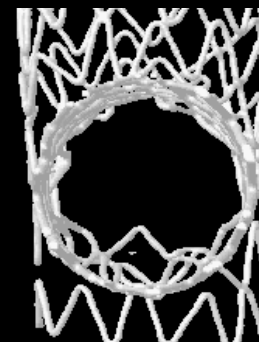
SB angle  
30degrees



SB angle  
60degrees



SB angle 90  
degrees

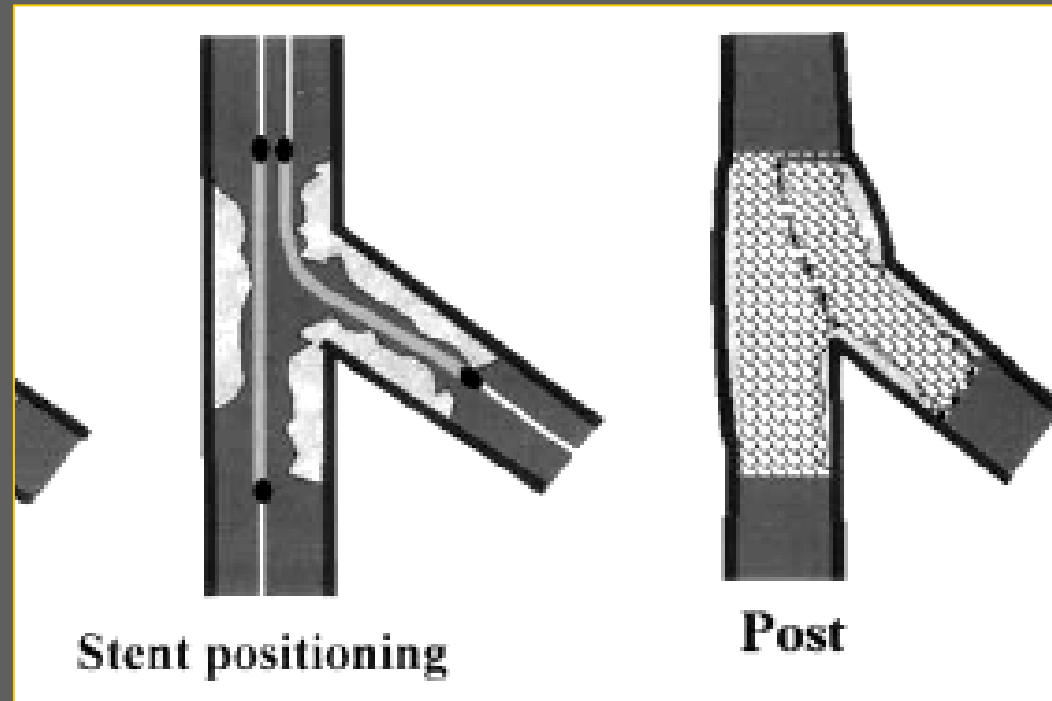


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**SKS**  
**Simultaneous Kissing**  
**Stents**

## **Simultaneous Kissing Stents (SKS) Technique for Treating Bifurcation Lesions in Medium-to-Large Size Coronary Arteries**

Samin K. Sharma, MD, Ahsan Choudhury, MD, Johnny Lee, MD, Michael C. Kim, MD, Edward Fisher, MD, Angelica M. Steinheimer, MD, and Annapoorna S. Kini, MD



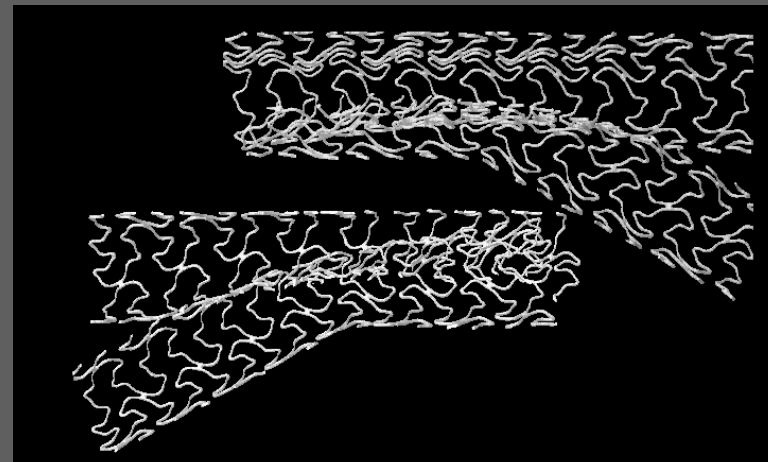
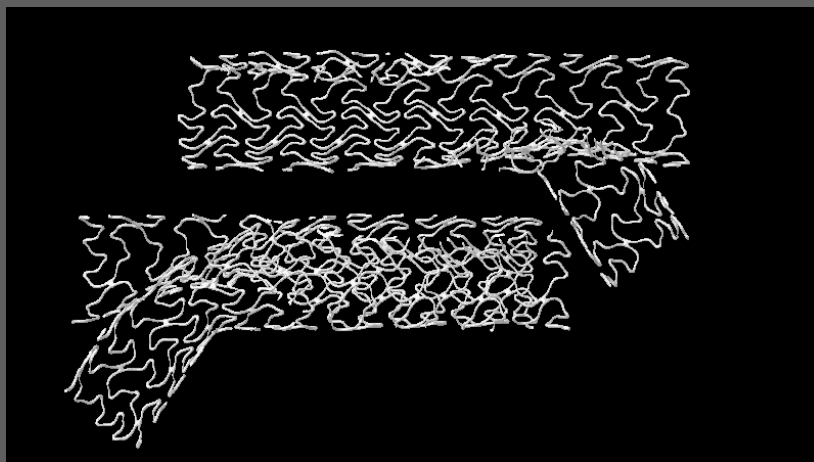
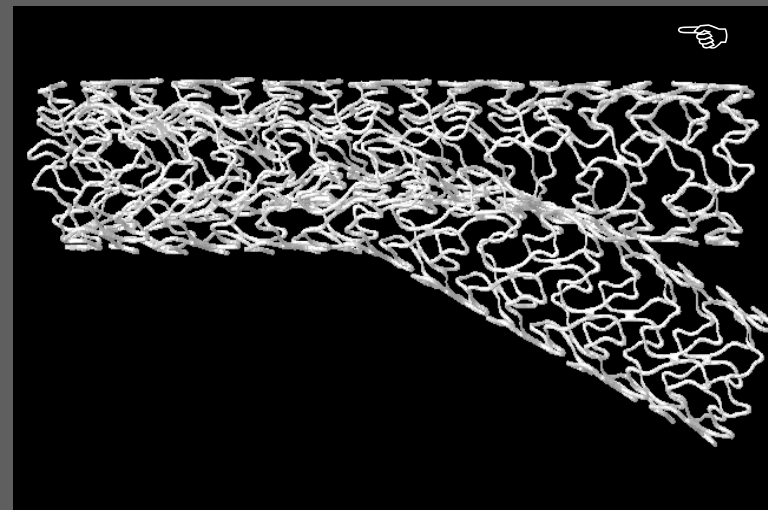
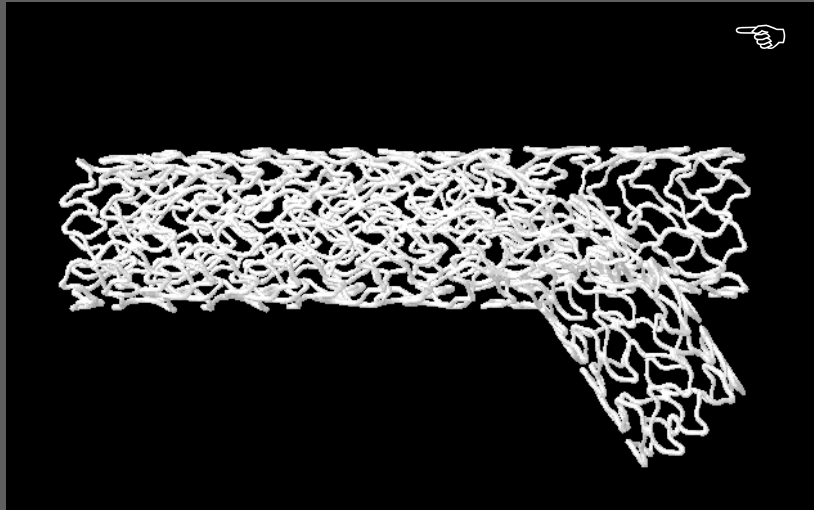
**Two stents are deployed simultaneously (or sequentially, then kissing post-dilatation)**

(Am J Cardiol 2004;94:913-917)

## **SKS Simultaneous Kissing Stents**

- Quick, easy
- SB security
- No wrap or alignment issues
- 8F Guide
- Considerable intravascular metal
- Has been used in L main stenting where it is advised to stent entire Lmain

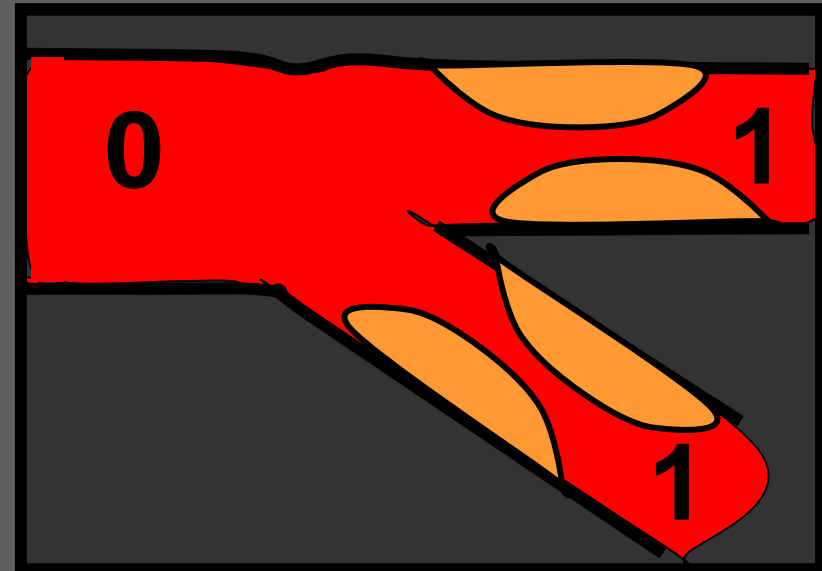
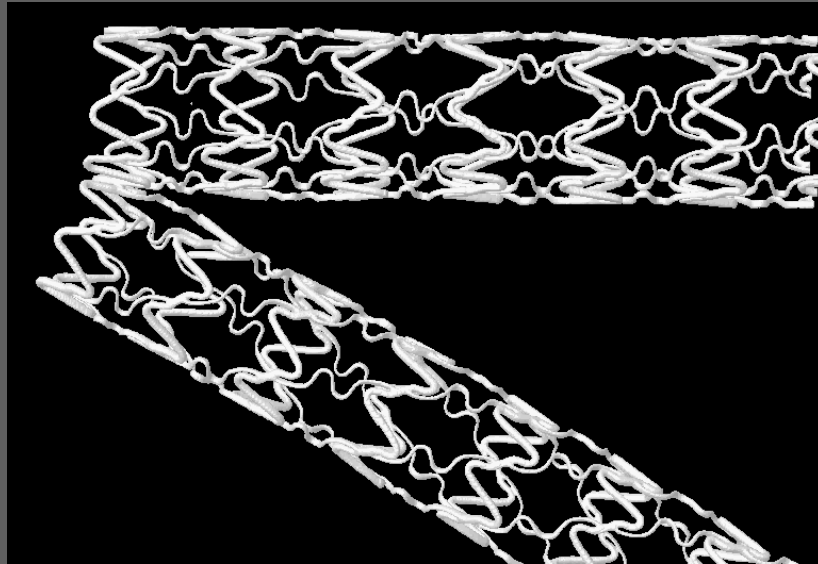
# SKS leaves considerable metal in the MB lumen



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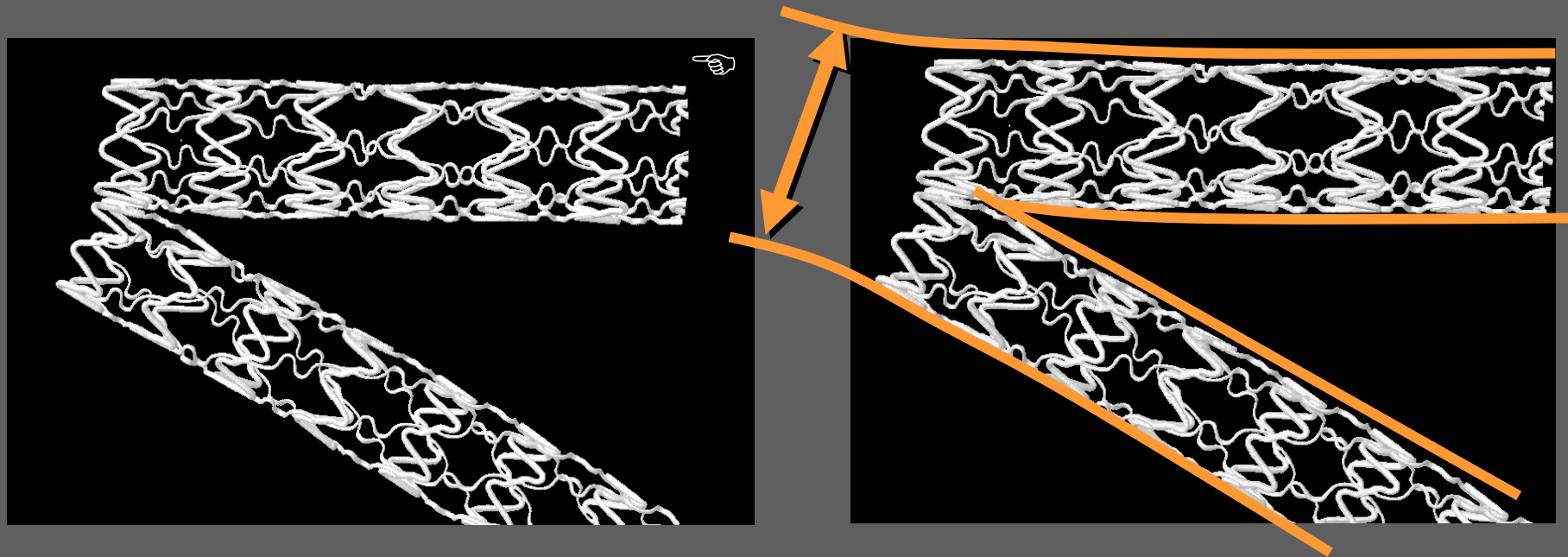
# “V” Stenting (with minimal overlap)

for Medina Classification 0, 1, 1



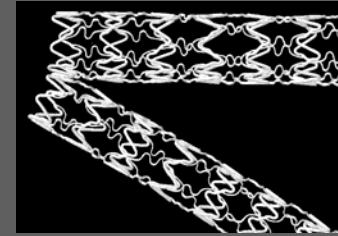


## “V” Stenting (with minimal overlap)



If upstream dissection occurs, there is a problem. Procedure may convert to “crush technique”.

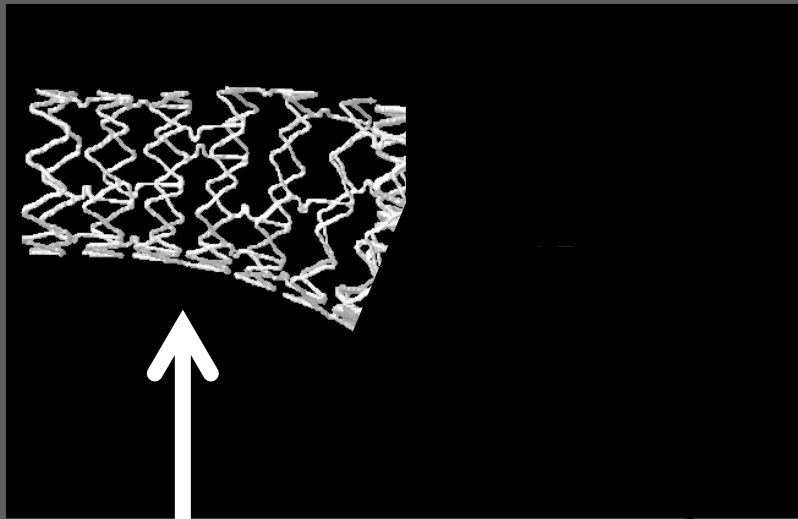
## “V” Stenting (with minimal overlap)



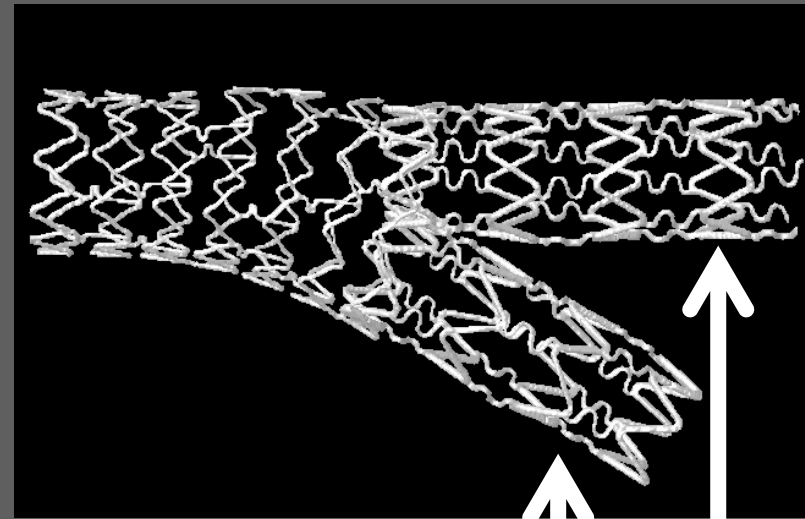
- Quick
- SB security
- No wrap or alignment issues
- 8F Guide
- Limited applicability-Suitable for Medina Classification 0, 1, 1
- If upstream dissection occurs, there is a problem

# Extended “Y”

(Helqvist, Heart 2006)



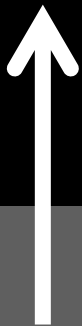
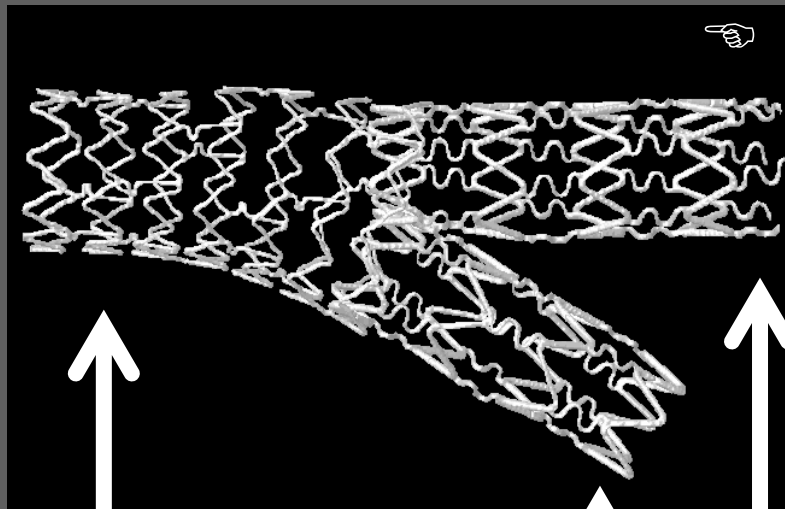
First Stent



Second and Third Stents

# Extended “Y”

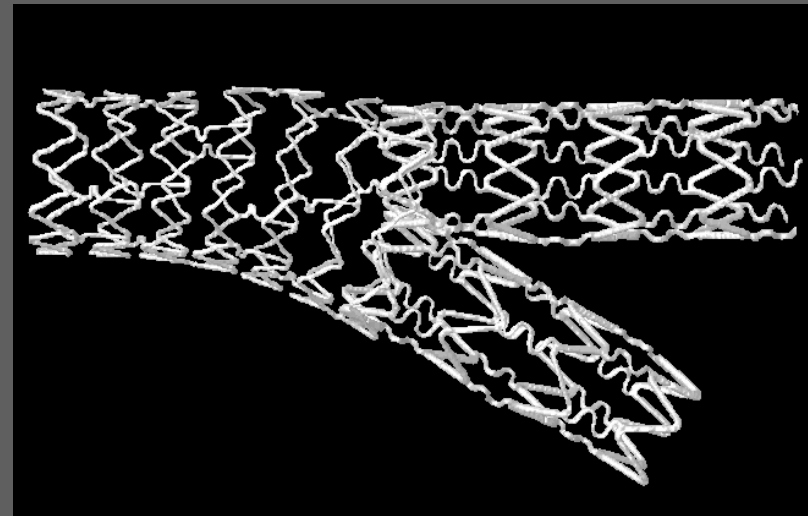
(Helqvist, Heart 2006)



First  
Stent



Second and  
Third Stents



*Ormiston*

## **Extended “Y” (Helqvist, Heart 2006)**

- SB protection- Both branches wired**
- No wrap or alignment issues**
- Good coverage**
- No obstruction**
- Minimal intraluminal metal and minimal multiple layers**
- Could be a provisional SB stent strategy**
- 8F guide**
- 3 DES**

## **Limitations of study**

- ▶ Deployment in phantoms may not represent deployment in patients**
- ▶ Full examination of strengths and weaknesses was not performed**
- ▶ Not all techniques were studied**

## Summary

<b>“T” stenting</b>	<b>gaps, or stent too proximal best with wide SB angles eg L main</b>
<b>“Crush”</b>	<b>Two step kissing post-dilatation greatly improves the SB ostium</b>
<b>Culotte</b>	<b>SB angle is important Shallow angles need large stent cell size</b>
<b>SKS</b>	<b>Considerable MB metal</b>
<b>“V”</b>	<b>Risk of upstream dissection</b>
<b>Extended “Y”</b>	<b>Safe, good coverage, 3 DES</b>